

633.1 DESCRIPTION

This work consists of furnishing and applying pavement marking materials and surface grooving of Portland cement concrete pavement or asphalt concrete pavement.

633.2 MATERIALS

Materials shall conform to the following Sections:

Cold applied plastic pavement markings and legends Section 983.

Paint Section 980

Glass beads Section 981.

633.3 CONSTRUCTION REQUIREMENTS

A. Cold Applied Plastic Pavement Marking and Legends:

1. **Width Tolerance:** Width shall be as specified with a tolerance of $\pm 1/8$ inch (± 3 mm).
2. **Surface and Air Temperature:** The surface shall be 70° F (21° C) minimum, and ambient air temperature of 60° F (15° C) minimum and rising, at a season when daily highs are above 70° F (21° C) and lows are above 40° F (4° C).
3. **Bonding:** To insure a uniform bond of material to asphalt or concrete surfaces after initial laydown, rolling of the material with a truck wheel, car wheel, or heavy hand roller is required.
4. **Pavement Condition:** Pavement must be dry, free of dirt, dust, and oily substances.
5. **Lane Lines:** Lane lines shall not be placed over a longitudinal pavement joint and shall not be installed closer than 1/2 inch (13 mm) or more than 1 1/2 inches away from the joint. Lane lines shall not deviate more than 1 inch (25 mm) per 200 feet (61 m), nor shall any deviations be abrupt.
6. **Waste Disposal:** It shall be the responsibility of the Contractor to provide for disposal of empty material cartons, liner papers, etc.
7. **Molding and Sealing:** The material shall mold to the pavement contours, breaks, and faults by the action of traffic. The material shall have resealing characteristics, which enable the material to fuse with itself and with previously applied marking materials of the same composition without externally applied tackifiers or adhesives.
8. **Prefabrication:** Prefabricated legends and symbols shall conform to the applicable shapes and sizes as outlined in the MUTCD.

- 9. Application Instructions:** The manufacturer shall supply proper application instructions, and shall identify activators and adhesives which are to be used. A copy of the application instructions shall be provided to the Engineer prior to use. The plastic markings shall be manufactured and packaged in a manner, which will permit storage at normal temperatures for up to one year after purchase.
- 10. Uniformity:** The material shall have a uniform cross section and be free of air inclusions and other film abnormalities.
- 11. Thickness:** The material shall be a minimum of 0.060 inch (1.5 mm) thick when measured without the precoated adhesive.
- 12. Deterioration:** Material must exhibit no significant deterioration due to exposure to climatic conditions, sunlight, water, oil, gasoline, or salt.
- 13. Serviceability:** Material must be free of ragged edges, die line, cracks, discolorations, and other defects, which would affect serviceability.

B. Inlay on Asphalt Surface Installation Requirements:

- 1. Surface Temperature:** Surface temperature of the asphalt shall not be less than 120° F (49° C) or more than 150° F (66° C).
- 2. Application:** Plastic pavement marking shall not be applied until compaction of the asphaltic mixture has been completed and all residual moisture has evaporated.
- 3. Initial Contact:** Pressure by foot or light hand roller shall be applied to insure initial contact with the surface.
- 4. Final Rolling:** Final inlay shall be accomplished with the use of a 5 to 10 ton (4500 to 9000 kilogram) tandem roller.
- 5. Rolling Procedure:** The roller motion shall be slow at all times, and shall not be reversed when wheels are on the marking material. The roller shall run straight at all times. Turning or twisting of roller wheels on the material shall not be permitted.
- 6. Use of Water:** Water shall be shut off or reduced to a minimum on roller wheels when rolling in pavement marking material.

- C. Pavement Marking Paint and Beads:** Pavement marking paint shall be applied by machine. On special areas and markings that are not adaptable to machine application, hand application will be permitted.

The paint shall be used as furnished by the manufacturer. Thinner or diluent shall not be added. The paint shall be thoroughly mixed in the original container before it is transferred to the tank of the spraying equipment. Filling tanks, pouring paint, or cleaning of equipment shall not be allowed on the pavement.

The pavement marking shall be applied during daylight hours when the ambient air temperature is above 45° F (7° C) and the road surface is dry. The pavement shall be cleaned of dirt, loose stones, and other foreign material before the paint is applied.

The paint applicator shall be a self-propelled spraying machine with nozzles capable of applying a minimum of three lines at one time, each gun applying 4 to 8 inches (100 mm to 200 mm) wide.

During pavement marking operations on sections of roadway open to traffic, the Contractor shall protect the markings from tracking either by placing suitable traffic control devices or by utilizing a shadow vehicle. The work shall be arranged such that half of the traveled roadway will be open to traffic at all times.

The Contractor shall take the steps necessary to assure that the permanent pavement markings will match the markings on the existing surface.

Tolerances:

1. The length of the painted stripe shall not vary more than plus or minus 3 inches (75 mm) from the plans requirement.
2. The width of the painted stripe shall not vary more than plus or minus 1/2 inch (12 mm) from the plans requirement.
3. The length of a 40 foot (12 meter) cycle length (stripe and gap) shall not vary more than 3 inches (75 mm).
4. The alignment from the plans requirement or existing markings shall not vary more than plus or minus 2 inches (50 mm).
5. The maximum longitudinal deviation from the existing markings at either end of the painted roadway segment shall not vary more than plus or minus 6 inches (150 mm).
6. Lane lines shall not deviate more than 1 inch (25 mm) per 200 feet (61 m), nor shall any deviations be abrupt.

Any markings that deviate outside these tolerances will be removed and replaced by the Contractor at no cost to the Department. Removal shall be performed utilizing equipment that is not detrimental to the final surface, as required by the Engineer.

The pavement marking paint shall be applied at a minimum wet thickness of 15 mils, equivalent to a dry thickness of 7 to 8 mils (0.381 mm, equivalent to a dry thickness of 0.178 mm to 0.203 mm). Glass beads shall be applied on the wet paint line at a minimum of six pounds of glass beads per gallon of paint (0.720 kg of glass beads per Liter of paint). Restriping of pavement markings to meet this requirement and to provide a quality retroreflective line shall be at the expense of the Contractor with no additional cost to the Department. Sections to be restriped shall be determined by the Engineer.

The paint shall be capable of being applied at paint temperature up to 160° F (71° C). When applied with glass beads at pavement temperatures above 45° F (7° C) and at relative humidities of up to 75 percent, the paint shall dry to a no-track condition within three minutes.

- D. Grooving for Pavement Marking Tape:** The equipment shall be capable of performing uniform grinding for alignment and depth.

The grooving shall be performed by a self-propelled machine equipped with gang mounted blades on a turning head. The equipment shall be capable of grooving the total width of the groove in one pass or be capable of grooving uniform depths with multiple passes. The equipment shall be capable of grooving double lines simultaneously or parallel lines to a uniform depth with two passes.

The grooving shall be performed within the following tolerances:

(English)		
Depth of Groove	30 mils	+10 mils
Width of 4" Groove	4 ½"	± 1/8"
Width of 6" Groove	6 ½"	± 1/8"
Width of 8" Groove	8 ½"	± 1/8"
Width of 12" Groove	12 ½"	± 1/8"
Width of 24" Groove	24 ½"	± 1/8"
Length of Skip Lines	10'-6"	± 3"
Tapers at ends of lines	6" to 9"	
Between Double Lines	4"	± ½"

(Metric)		
Depth of Groove	0.762 mm	+ 0.25 mm
Width of 100 mm Groove	115 mm	± 3 mm
Width of 150 mm Groove	165 mm	± 3 mm
Width of 200 mm Groove	216 mm	± 3 mm
Width of 300 mm Groove	318 mm	± 3 mm
Width of 600 mm Groove	622 mm	± 3 mm
Length of Skip Lines	3200 mm	± 75 mm
Tapers at ends of lines	150 mm to 225 mm	
Between Double Lines	100 mm	± 13 mm

The grooving alignment and straightness tolerances shall be the same as required for the marking tape as specified in Section 633.3.A.5.

Priming and tape application shall only be performed on dry clean pavement in weather conditions acceptable to the Engineer and according to the pavement marking tape manufacturer recommendations. If the groove is exposed to traffic or adverse weather conditions overnight, the Contractor shall sand blast the groove prior to priming and applying tape.

633.4 METHOD OF MEASUREMENT

- A. Cold Applied Plastic Pavement Marking:** Pavement marking, of the width and color specified will be measured by the foot (0.1 meter).
- B. Cold Applied Plastic Pavement Marking Arrows:** Pavement marking arrows will be measured by count of each type specified.
- C. Cold Applied Plastic Pavement Marking Messages:** Pavement marking messages will be measured by count of each complete word specified.
- D. Cold Applied Plastic Pavement Marking Areas:** Marking areas will be measured to the nearest square foot (0.1 square meter).
- E. Pavement Marking Paint and Beads:** Paint and beads will be measured to the nearest ½ gallon (1 L) of paint.
- F. Grooving for Pavement Marking Tape:** Grooving for pavement marking tape installation will be measured to the nearest foot (0.1 meter), along the length of the groove for the width of grooving specified in the plans. Grooving for words and messages will be measured by the word. Grooving for arrows will be measured by the each and miscellaneous grooving will be measured to the nearest square foot (0.1 square meters).

633.5 BASIS OF PAYMENT

- A. Cold Applied Plastic Pavement Marking:** Pavement marking of each width specified, will be paid for at the contract unit price per foot (0.1 meter).
- B. Cold Applied Plastic Pavement Marking Arrows:** Pavement marking arrows of the type specified will be paid for at the contract unit price per each.
- C. Cold Applied Plastic Pavement Marking Messages:** Pavement marking messages will be paid for at the contract unit price per each word.
- D. Cold Applied Plastic Pavement Marking Areas:** Pavement marking areas will be paid for at the contract unit price per square foot (0.1 square meter).
- E. Pavement Marking Paint and Beads:** Paint and beads will be paid for at the contract unit price per gallon (Liter) for each color of pavement marking paint. Payment will be full compensation for furnishing paint and beads and for labor, equipment, and incidentals necessary.
- F. Grooving for Pavement Marking Tape:** Grooving will be paid for at the contract unit price per foot (0.1 meter) for the width of groove specified or the contract unit price per word, per arrow, each, or square foot (0.1 square meter) as required by the respective contract item. Payment will be full compensation for equipment, labor, materials, and all incidentals required.

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